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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/381,295	09/22/1999	SHIGERU AIHARA	0057-2521-0P	3791
22850	7590	12/01/2003	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			DOVE, TRACY MAE	
			ART UNIT	PAPER NUMBER

1745

DATE MAILED: 12/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/381,295

Applicant(s)

AIHARA ET AL.

Examiner

Tracy Dove

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-14,17 and 19-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8 is/are allowed.
- 6) ☒ Claim(s) 1-3,5-7,9-14,17 and 19-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the communication filed on 9/8/03.

Applicant's arguments have been considered, but are not persuasive. Furthermore, the claims are rejected in view of newly found prior art. Claims 1-3, 5-14, 17 and 19-21 are pending. Claim 8 has been allowed.

Claims Analysis

The claims recite an adhesive resin of "polyvinylidene fluoride", which is interpreted as a fluorocarbon resin containing a polyvinylidene fluoride structure. See specification page 14, 2nd paragraph. Furthermore, "polyvinyl alcohol" is interpreted as a polymer containing polyvinyl alcohol in the molecular structure. See specification page 14, 2nd paragraph. The specification describes "polyvinylidene fluoride" in generic terms as a fluorocarbon resin. The term "polyvinylidene fluoride" is used in the art to refer to both polyvinylidene fluoride homopolymers and polyvinylidene fluoride copolymers.

Note if Applicant wishes to exclude polyvinylidene fluoride copolymers from the instant claims, Examiner suggests the claims be amended to recite "polyvinylidene fluoride homopolymer".

Claim Objections

Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 9 does not further limit independent claim 1.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-7, 9, 14, 17 and 19-21 are rejected under 35 U.S.C. 102(e)/103(a) as being anticipated by, and alternatively unpatentable over, Delnick, US 5,948,464 as evidenced by Takeuchi et al., US 6,096,456.

Delnick teaches a method of forming a porous composite separator layer for an electrochemical cell. A separator precursor solution is applied to one of the cell electrodes. The precursor solution comprises a filler material dispersed in a solution of a polymer binder which is dissolved in a suitable solvent. The process allows the manufacture of thin and flexible composite separators which are conformally bonded to the underlying electrodes (see abstract). Figure 1 shows a cell 10 comprising a negative electrode 19 having a collector 20 and active material layer 15, a positive electrode 29 having a collector 30 and an active material layer 16, and a separator (adhesive resin

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layer) 25. A liquid electrolyte (electrolytic solution) is contained within the pores of the porous separator material so that the electrolyte provides a conducting medium between the first and second electrode layers (col. 5, lines 1-7). The filler material is a solid particulate material such as alumina, silica or magnesia having a particulate size in the range of from about 0.01 μm to about 1.0 μm (col. 6, lines 45-67). The polymeric binder may consist of a single polymer, a mixture of polymers or a mixture of polymers and copolymers. Typical binders include polyvinyl chloride (PVC), polyvinylidene fluoride-hexafluoropropylene copolymer (PVDF) and ethylene propylene hexadiene monomer (EPDM). The ratio of polymer binder to solid particulate material ranges from about 5/95 to 35/65 (see col. 7, lines 5-27). The separator has a thickness of 5-100 μm and is directly adjoined to the electrode so that the electrode imparts the strength needed to support the separator (col. 9, lines 15-37). An electrolyte comprising propylene carbonate and LiClO_4 was dispersed into the separator (example 1). Example 2 of Delnick discloses the separator precursor contains 30 parts PVDF binder to 70 parts of alumina.

Delnick is silent regarding an uneven electrode surface or a peel strength in a range of from 50 gf/cm to 85 gf/cm. However, one having ordinary skill in the art would have known that the surfaces of the electrodes are inherently uneven. This is evidenced by Takeuchi which teaches the electrodes have holes, or are uneven (col. 25, lines 17-29). The background section of the instant specification teaches that electrodes have their surfaces smoothed by pressing but still have unevenness of several microns to form vacancies where a conventional separator and the electrodes are not in contact (bottom of

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page 3-top of page 4). Thus, the skilled artisan would have known that electrodes inherently have an uneven surface.

Note that since the materials of the inventive separator of Delnick (Example 2 teaches alumina and PVDF) and those of the instant invention (all the Examples in Table 2-4 teach alumina and PVDF) are the same, the separator material of Delnick will also fill any space in an uneven electrode surface. Furthermore, Delnick teaches the composite separator is conformally bonded to the electrode plate (col. 8, lines 46-48). Similarly, one of skill would expect the inventive separator of Delnick to have a peel strength equivalent to that of the instant claims. Specifically, Delnick teaches the same ratios of adhesive resin to filler material. Thus, one of skill in the art would have known that the peel strength between the separator(adhesive layer) and electrodes of Delnick would inherently be the same as the peel strength between the adhesive layer and electrodes of the claimed invention. Furthermore, Delnick teaches the interface between the separator and electrode is less likely to delaminate (peel) due to thermal or electrochemical expansion or contraction during operation of the cell (col. 9, lines 7-10).

Regarding claims 5 and 6, Examples 1 and 2 of Delnick teach the solvent content of the separator precursor (ink) ranges from 60-75% (col. 10, lines 16-17). Then the precursor was applied to the electrode and the solvent was removed to create the pores of the separator. Thus, the pore void volume of the separator is 60-75% and the polymer/resin volume is 25-40% of the separator.

Note both the PVDF of Delnick (col. 10, line 4) and the PVDF of the instant invention (page 16, line 20) were obtained from Elf Atochem.

Thus the claims are anticipated or, alternatively, obvious.

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The MPEP states the express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995). Something which is old does not become patentable upon the discovery of a new property. The claiming of a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable. In *re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). A rejection under 35 U.S.C. 102/103 can be made when the prior art product seems to be identical except that the prior art is silent as to an inherent characteristic.

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Claims 1, 2, 5-7, 9, 14, 17 and 19-21 are rejected under 35 U.S.C. 102(e)/103(a) as being anticipated by, and alternatively unpatentable over, Liu et al., US 5,720,780, as evidenced by Takeuchi et al., US 6,096,456.

Liu teaches a battery comprising a negative electrode containing an active material, a positive electrode containing an active material and a separator therebetween. The separator (adhesive resin layer) includes a homopolymeric binder(col. 2, lines 62-col. 3, lines 29). The binder material is a homopolymer of polyvinylidene fluoride (KYNAR Elf Atochem). The separator further includes an inorganic filler such as alumina or silica (semiconductor) to provide structural stability to the binder (col. 3, lines 54-67). The ratio of filler to binder (by weight) is generally from about 1:1 to about 1:2 and will vary with the specific materials used and the degree of homogenization (col. 4, lines 43-47). The battery includes a non-aqueous electrolyte solvent and a lithium electrolyte salt (col.

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7, lines 60-col. 8, lines 35). Note Table 1 wherein "2801" indicates a polyvinylidene fluoride copolymer and, "741" and "461" are polyvinylidene fluoride homopolymers.

The particle size of the filler is preferably less than about 5 μm (col. 4, lines 39-42).

Regarding claims 5 and 6, the separator layer of Liu includes the binder, the filler and a plasticizer. The separator includes 2 parts filler, 3 parts binder and 7.5 parts plasticizer (1 part/binder to 1.5 parts plasticizer (0.66)) (col. 5, lines 4-30). The plasticizer is extracted to create porosity within the separator layer and the battery is activated by the addition of a solvent/electrolytic salt solution (fills voids/pores of separator) (col. 7, lines 30-59).

Liu is silent regarding an uneven electrode surface or a peel strength in a range of from 50 gf/cm to 85 gf/cm.

However, one having ordinary skill in the art would have known that the surfaces of the electrodes are inherently uneven. This is evidenced by Takeuchi which teaches the electrodes have holes, or are uneven (col. 25, lines 17-29). The background section of the instant specification teaches that electrodes have their surfaces smoothed by pressing but still have unevenness of several microns to form vacancies where a conventional separator and the electrodes are not in contact (bottom of page 3-top of page 4). Thus, the skilled artisan would have known that electrodes inherently have an uneven surface. Liu teaches that the negative electrode, separator and positive electrode are assembled together and then pressurized and heated under pressure to provide bonding between the negative electrode/separator/positive electrode (col. 3, lines 29-32). Thus, the separator layer fills the space defined by the uneven electrode surfaces.

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One of skill would expect the inventive separator of Liu to have a similar peel strength as that of the instant claims. Specifically, Liu teaches the same ratios of adhesive resin to filler material. Thus, one of skill in the art would have known that the peel strength (between the separator and electrodes) of Liu and the peel strength (between the adhesive layer and electrodes) of the claimed invention are similar. Specifically, the separator of Liu and the adhesive resin layer of the claimed invention seem to be identical.

Thus the claims are anticipated or, alternatively, obvious.

The MPEP states the express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." In re Napier, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995). Something which is old does not become patentable upon the discovery of a new property. The claiming of a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable. In re Best, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). A rejection under 35 U.S.C. 102/103 can be made when the prior art product seems to be identical except that the prior art is silent as to an inherent characteristic.

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Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delnick, US 5,948,464 (as evidenced by Takeuchi et al., US 6,096,456) in view of Yamashita et al., US 6,287,720.

See discussion of Delnick above.

Delnick is silent regarding a plurality of laminates of a plurality of positive electrodes, negative electrodes and adhesive resin layers that may be either spirally wound (rolled up) or folded.

However, Yamashita teaches a battery comprising a positive electrode, a negative electrode and a sole porous separator (adhesive layer) disposed between the positive electrode and the negative electrode. The three layer structure is disposed in a casing containing an electrolyte. The porous separator includes at least one insulating substance (filler). See abstract. Example 2 teaches a separator having insulating particles of alumina with an average particle diameter of 1.0 μm and a PVDF binder. The particles of alumina and particles of PVDF were mixed with each other to obtain a powder mixture. Then solvent was added to the mixture to obtain a slurry. The slurry may be applied to either or both electrodes and dried to obtain the separator. See col. 22, lines 1-36. The cell of Yamashita can be used in the form of a spirally wound structure in which the unit cell is spirally wound so that the negative electrode of the wound unit cell is positioned on the side of the outer surface of each wind of the spirally wound structure, or in the form of a laminate structure in which a plurality of the unit cells are laminated so that each positive electrode is positioned opposite to a negative electrode through a separator. See col. 13, line 58-col. 14, line 9.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have known that the electrochemical cell of Delnick could be used in the form of a plurality of unit cells laminated or wound together. It is well known in the art to provide a battery comprising a plurality of unit cells. This is shown by Yamashita which teaches

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a similar unit cell to that of Delnick. Thus, one of skill in the art would have been motivated to form a battery comprising a plurality of laminated unit cells as disclosed by Delnick in view of the teachings of the prior art.

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Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al., US 5,720,780 (as evidenced by Takeuchi et al., US 6,096,456) in view of Yamashita et al., US 6,287,720.

See discussion of Liu above.

Liu is silent regarding a plurality of laminates of a plurality of positive electrodes, negative electrodes and adhesive resin layers that may be either spirally wound (rolled up) or folded.

However, Yamashita teaches a battery comprising a positive electrode, a negative electrode and a sole porous separator (adhesive layer) disposed between the positive electrode and the negative electrode. The three layer structure is disposed in a casing containing an electrolyte. The porous separator includes at least one insulating substance (filler). See abstract. Example 2 teaches a separator having insulating particles of alumina with an average particle diameter of 1.0 μm and a PVDF binder. The particles of alumina and particles of PVDF were mixed with each other to obtain a powder mixture. Then solvent was added to the mixture to obtain a slurry. The slurry may be applied to either or both electrodes and dried to obtain the separator. See col. 22, lines 1-36. The cell of Yamashita can be used in the form of a spirally wound structure in which the unit cell is spirally wound so that the negative electrode of the wound unit cell is positioned on the side of the outer surface of each wind of the spirally wound structure,

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or in the form of a laminate structure in which a plurality of the unit cells are laminated so that each positive electrode is positioned opposite to a negative electrode through a separator. See col. 13, line 58-col. 14, line 9.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have known that the electrochemical cell of Liu could be used in the form of a plurality of unit cells laminated or wound together. It is well known in the art to provide a battery comprising a plurality of unit cells. This is shown by Yamashita which teaches a similar unit cell to that of Liu. Thus, one of skill in the art would have been motivated to form a battery comprising a plurality of laminated unit cells as disclosed by Liu in view of the teachings of the prior art.

Allowable Subject Matter

Claim 8 has been allowed.

Response to Arguments

Applicant's arguments filed 9/8/03 have been fully considered but they are not persuasive.

If the claims are amended to recite "polyvinylidene fluoride homopolymer", the 35 U.S.C. 102(e) rejection in view of Delnick will be removed (note such an amendment could necessitate a new grounds of rejection). However, Applicant assertion that Delnick does not suggest a polyvinylidene fluoride homopolymer is not accurate. Specifically, Delnick teaches that the polymeric binder may consist of a single polymer

(homopolymer). Applicant attempts to distinguish the claimed invention over Delnick by comparing the claimed invention with Yamashita. It is unclear what Applicant is

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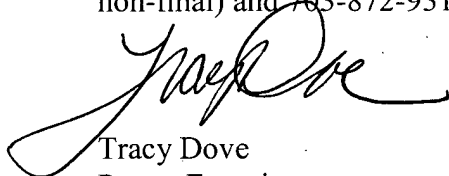
attempting to show because Delnick teaches the claimed weight ratio of the adhesive resin to the filler. Yamashita is only applied to show the different types of battery structures.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Both Kezuka (US6,395,428) and Miyaki (WO98/59384) teach the claimed invention, but are not available as prior art against the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is (703) 308-8821. The Examiner may normally be reached Monday-Thursday (9:00 AM-7:30 PM). My supervisor is Pat Ryan, who can be reached at (703) 308-2383. The Art Unit receptionist can be reached at (703) 308-0661 and the official fax numbers are 703-872-9310 (after non-final) and 703-872-9311 (after final).



Tracy Dove
Patent Examiner
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November 20, 2003
